PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference WPP87283	**FOR FURTHER ACTION**	See Form PCT/IPEA/416
International application No. PCT/GB2004/001210	International filing date *(day/month/year)* 18.03.2004	Priority date *(day/month/year)* 18.03.2003
International Patent Classification (IPC) or national classification and IPC A01H5/00		
Applicant HORTICULTURE RESEARCH INTERNATIONAL et al.		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 9 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☐ *sent to the applicant and to the International Bureau)* a total of sheets, as follows:
      ☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

☒	Box No. I	Basis of the opinion
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
11.01.2005	01.03.2005
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Valcarcel, R Telephone No. +49 89 2399-2368

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/GB2004/001210

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
   - ☐ international search (under Rules 12.3 and 23.1(b))
   - ☐ publication of the international application (under Rule 12.4)
   - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

1-18 as originally filed

Sequence listings part of the description, Pages

1 as originally filed

Claims, Numbers

1-28 as originally filed

Drawings, Sheets

1/5-5/5 as originally filed

☒ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
   - ☐ the description, pages
   - ☐ the claims, Nos.
   - ☐ the drawings, sheets/figs
   - ☐ the sequence listing *(specify)*:
   - ☐ any table(s) related to sequence listing *(specify)*:

* *If item 4 applies, some or all of these sheets may be marked "superseded."*

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	2-27
	No:	Claims	1,28
Inventive step (IS)	Yes:	Claims	NONE
	No:	Claims	1-28
Industrial applicability (IA)	Yes:	Claims	1-28
	No:	Claims	NONE

2. Citations and explanations (Rule 70.7):

see separate sheet

Supplemental Box relating to Sequence Listing

Continuation of Box I, item 2:

1. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this report has been established on the basis of:

   a. type of material:

   ☒ a sequence listing

   ☐ table(s) related to the sequence listing

   b. format of material:

   ☒ in written format

   ☒ in computer readable form

   c. time of filing/furnishing:

   ☒ contained in the international application as filed

   ☒ filed together with the international application in computer readable form

   ☐ furnished subsequently to this Authority for the purposes of search and/or examination

   ☐ received by this Authority as an amendment on

2. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

3. Additional observations, if necessary:

Re Item V

1.

The document numbering corresponds to the order of citation in the search report.

2.

The present application does not meet the criteria of Article 33(1) PCT, because **the subject-matter of claims 1 and 28 is not new** in the sense of Article 33(2) PCT.

2.1

D1 discloses a dwarf plant (Pea), comprising a rootstock (Na or na stocks) and a scion grafted thereon (na scion), wherein levels of one or more selected gibberellins (GAs) in the scion are reduced (see page 1355, left column, third paragraph, and page 1357, right column, second paragraph). Thus D1 is prejudicial to the subject-matter of claim 1 of the present application.

2.2

The subject-matter of claim 28 is also considered as not novel. It is noted that the dwarf Pea plant in D1 has not apparently been produced by the methods defined in claims 26 and 27 of the present application. However, D1 discloses a dwarf plant comprising a rootstock and a scion grafted thereto, wherein at least the scion has reduced levels of GAs (see page 1355, left column, third paragraph, and page 1357, right column, second paragraph). Said plant is apparently indistinguishable of a plant produced by the process of claims 26 or 27.

3. The present application does not meet the criteria of Article 33(1) PCT, because **the subject-matter of claims 2-27 does not involve an inventive step** in the sense of Article 33(3) PCT. For the sake of efficiency and clarity, the objection of inventive step is formulated for the subject-matter of claim 10 of the present application (see below sections 3.1 to 3.4), and then the subject-matter of the other claims will be analyzed subsequently (see below section 3.5).
Applying the problem/solution approach for the subject-matter of claim 10:

3.1

D2 or **D3** are regarded as being the closest prior art to the subject-matter of claim 10. D2 discloses a methods to regulate plant growth by expressing sense or antisense GA-20 oxidase (see abstract). In particular, the use of antisense GA-20 oxidase to reduce vegetative growth is disclosed (see from last line of page 25 to line 19 of page 269). D3 also discloses antisense sequences to inhibit GA-20 oxidase among other GA-enzymes, see claims 8 and 9) in order to control GA levels. The use of the control of GA levels to reduce plant height is also disclosed (see e.g. page 9, lines 5-11).

It is here noted that also **D4** could be considered as alternative closest prior art document since also discloses that suppression of Arabidopsis GA-20 oxidase by antisense RNA causes reduction of plant size (see page 528, right column, last paragraph).

3.2

The subject-matter of claim 10 therefore differs from D2 and D3 in that in the present application the plant where the GA synthetic enzyme is inhibited in order to reduce the size of said plant, is grafted into a rootstock.

3.3

The problem to be solved by the present invention may therefore be regarded as to provide alternative plants having a GA synthetic enzyme inhibited in order to reduce the size of that plant.

3.4

The solution proposed in claim 10 of the present application cannot be considered as involving an inventive step (Article 33(3) PCT) for the following reasons.

D6 discloses reciprocal grafts of tall and dwarf peach varieties, it was found that the scion characteristics determined the phenotype and growth characteristics of the tree irrespective of the rootstock (see abstract of D6).

D7 discloses a dwarf mutant of sweet potato, and the GA relationships between rootstock and scion combining both normal and dwarf mutant. Grafting onto normal stock did not induce normal growth of the dwarf scion, grafting of normal scions onto dwarf stocks did not affect the growth of the scion (see page 40). Thus, the growth rate was determined by the scion.

The skilled person in view of the teachings of either D2 or D3 combined with the teachings of either D6 or D7, would have produced a dwarf plant comprising a

rootstock and a scion grafted thereon, wherein the scion the GA levels are reduced by inhibiting a GA synthetic enzyme.

The advantage of being able to use a big collection of well known rootstocks (adapted either to particular soil conditions, humidity, temperature, or resistant to certain diseases), in combination with a scion of the plant which size wants to be reduced is obvious. A vast collection of rootstocks were known in the prior art, for example, see any of D8 to D10 which describe different rootstocks (including numerous apple rootstocks). Furthermore, in D8 (see introduction on page 115), it is disclosed that genetic dwarfing is the main choice for controlling tree size.

3.5

Claims 2-9, and 11-27 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of inventive step.

The sequence of the GA-20 oxygenase from apple trees (Malus sp) was known. Nucleotides 860-1061 of D5 are 93,1% identical to nucleotides 203-2 of SEQ ID NO: 1 of the present application. Thus, even the particular SEQ ID NO: 1 does not appear to confer inventive step to the subject-matter of claim 17 since no unexpected effect can be envisaged by using this particular construct.

The particular rootstocks mentioned in claim 25 of the present application are well known in the art (for example see abstracts of D12 and D8). The enumeration of different species or varieties of rootstocks or scions (as recited

for example in claims 2-8) does not confer inventive step either since no unexpected effect is associated to the possible combinations of scions and rootstocks, the skilled person would select the appropriate combination depending on the particular needs (see abstract of D11, wherein reference is made to the need to select the appropriate combination of rootstocks and scions when intending to make dwarf apple trees).